DOCUMENT RESUME

ED 115 023 EC 080 420

AUTHOR	Efron, Marvin; DuBoff, Beth Reilly
TITLE	A Vision Guide for Teachers of Deaf-Blind Children.
INSTITUTION	North Carolina State Dept. of Public Instruction, Raleigh. Special Education Instructional Materials Center.
SPONS AGENCY	Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
PUB DATE	75
NOTE	66p.
EDRS PRICE	MF-$0.76 HC-$3.32 Plus Postage
DESCRIPTORS	*Deaf Blind; Definitions; Early Childhood Education; Elementary Secondary Education; *Evaluation Methods; Exceptional Child Education; Guidelines; Instructional Materials; Multiply Handicapped; *Teaching Methods; *Vision; *Visual Perception

ABSTRACT

The guide for teachers of deaf blind children deals with visual functioning, evaluation, and instruction. An overview of the fundamentals of visual functioning in deaf blind children includes concepts basic to an understanding of the process. Assessment and evaluation of the child's visual functioning is discussed, and procedures for determining status and progress are presented. A final section of the monograph includes techniques and materials for development of the child's visual skills. Appendixes include a composite scale of visual development in normal children, a glossary of terms related to the eye and vision, and a teacher's guide for evaluating visual functioning. (Author/LS)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

A Vision Guide
For
TEACHERS OF DEAF-BLIND CHILDREN

by
Marvin Efron, O.D., Ph.D.
and
Beth Reilly DuBoff, M.A.

ED115023

EC080420

CONTENTS

Page

Preface ii

Part

I. Introduction 1

II. Visual Functioning and Deaf-Blind Children 2

III. Evaluating Visual Functioning 5

IV. Techniques and Materials for Improving Visual Functioning 18

Appendices

A. Visual Development in Normal Children—A Composite Scale 31

B. A Glossary of Terms Relating to the Eye and Vision 35

C. Teacher's Guide for Evaluating Visual Functioning 47

D. Labeled Diagram of the Eye 57

Bibliography 60

Acknowledgements

The authors would like to express their sincere appreciation to the numerous individuals who have contributed their time and efforts to the betterment of this publication.

Special recognition needs to be extended to Dr. Erwin Friedman and the National Children's Center for support, both professionally and financially, of this publication, to Dr. George Lackey of the University of South Carolina for his efforts in the editing of this document, to the North Carolina State Department of Public Instruction, Division for Exceptional Children, Dr. A. Craig Phillips, Superintendent and Theodore R. Drain, Director for their support of these efforts and to the South Atlantic Regional Center for Deaf-Blind for without whose support, this publication would not have been possible.

This project is funded under Public Law 91-230, Title VI, Part C, Education of the Handicapped Act as subcontracted through the North Carolina State Department of Public Instruction, A. Craig Phillips, State Superintendent, Theodore R. Drain, Director, Division for Exceptional Children, and Hank Baud, Regional Coordinator.

Part I

Introduction

The purpose of the present monograph is to provide teachers of deaf-blind children with a concise handbook dealing with visual functioning, evaluation, and instruction. In spite of its brevity, the volume has been designed to serve as a practical guide to those teachers charged with the responsibility of assisting in the visual and educational development of deaf-blind children.

The guide has been organized in four sections and several appendices. Part II is an overview of the fundamentals of visual functioning in "deaf-blind children" and includes concepts basic to an understanding of the process. In Part III, assessment and evaluation of the child's visual functioning is discussed, and procedures for determining status and progress are presented. The final section of the monograph includes techniques and materials for the teacher to use in assisting the child to develop visual skills. The appendices include information related to vision and visual functioning which may be of help to the teacher of deaf-blind children.

The guide provides basic information in the field of visual functioning which may be of help to the teacher of deaf-blind children.

The guide provides basic information in the field of visual functioning, evaluation, and instruction, but it was intended to be an in-depth presentation. For a more thorough and comprehensive study, the reader is referred to the bibliography at the end of the manual.

Part II

Visual Functioning and Deaf-Blind Children

Before beginning a discussion of visual functioning in deaf-blind children, it is necessary to clarify what seems to be a contradiction in terms by offering a definition of the deaf-blind child. The Bureau of Education for the Handicapped uses the following definition:

> . . . "deaf-blind children" means children who have auditory and visual handicaps, the combination of which causes such severe communication and other developmental and educational problems that they cannot properly be accomodated in special education programs solely for the hearing handicapped child or for the visually handicapped child.[1]

An initial consideration in working with deaf-blind children is the recognition that a large percentage of them do have some degree of usable vision. Traditionally, visual acuity has been used as the criterion for determining the degree of usable vision of an individual. Often children with very low measured visual acuity are given little or no opportunity to develop visual skills because their vision is too limited to ever be a primary source of learning. Nevertheless, a primary objective of teachers should be to develop visual skills to the highest possible efficiency in order to supplement the child's auditory and tactile skills.

Vision begins in the eye, but the eye is only the receptor for the visual sense. Light enters the eye and the image is registered on the retina. The retina sends an impulse along the optic nerve to the brain where the visual image is given interpretation. Although they overlap and influence each other to a great degree, there are three separate areas of this process that needed to be considered. They are areas of *sensation, visual-motor, and visual* perception.

[1]Centers and Services for Deaf-Blind Children. Proposed Rules. Part 121c37. Federal Register. Volume 38. Number 196. October 11, 1973.

Sensation refers to the reception of light or form by the retina. The more efficient the eye is as an organ of sensation, the better the quality of the image that is received and transmitted along the optic nerve. For example, a person views a cup. The image of the cup passes through the eye as light energy and touches the retina. The image is transformed on the retina into an impulse that is carried by the optic nerve to the brain. Thus, sensation depends on the eye, the ocular pathway, and the brain. If there is malfunctioning in any of these components, there is a decrease or absence of sensation. The most basic level of sensation is the recognition of light. Higher levels of sensation involve form and color.

A basic and measurable aspect of sensation is visual acuity. Visual acuity refers to the ability to discriminate details of objects of specified distances. For example, when a child is able to discriminate a cup from a bowl across a room, he is demonstrating visual acuity at distance; when he makes finer discriminations of smaller objects within arm's length, he is demonstrating visual acuity at near point.

There are several ways of measuring visual acuity in high-functioning children. One of the most common techniques is the use of the Snellen Chart. It is most important that the teacher be aware of the degree of visual acuity a child possesses, both at distance and near-point. Naturally, this information would influence the selection of learning activities and materials.

The second area of the vision process that requires attention is the visual motor area. This area includes the brain's directing and focusing the eyes and the coordination of sight with other parts of the body. The brain must give directions to the eye concerning where to look and when to focus. An important aspect of this process is accommodation which refers to the ability of the eye to change focus in order to see effectively at distance or at near point.

In addition to the muscular control necessary to seeing, the muscular control necessary to coordinate an effective use of other parts of the body — hands, feet, etc. — depends on vision. It has been demonstrated conclusively that the seeing child develops gross and fine motor skills and body awareness much more quickly than the non-seeing child. Therefore, the more severe the visual impairment, the greater the need for visual-motor training.

The final area of the vision process that requires consideration is that of visual perception. This refers to the child's ability to give meaning and understanding to what has been seen. For example, a child sees a cup, picks it up, and drinks from it. The action of drinking from the cup indicates that he understands the function of what he has seen. Obviously, visual perception is largely a matter of learning and prior experience.

Because visual perception is learned, this is the area of vision in which a deaf-blind child can make the most progress. But to make this progress, it is necessary for him to be exposed to a rich, stimulation-oriented environment. The earlier a child is given assistance in visual perceptual training, the easier it is for him to learn.

According to Barraga[2], the visual functioning of a child is primarily *developmental and can be improved by systematic* training. The more a child uses his vision, especially at close range, the more he stimulates the pathways to the brain. As the brain receives more and more information, there is an eventual accumulation of a variety of visual images and memories.

One of the primary problems of the low vision child is that there is very little incidental learning through the visual sense. The child must be *taught* to discriminate among the forms, outlines, and symbols which may never have been brought to his attention. In the deaf-blind child, this does not "just happen". Visual perception is much more than clearness and sharpness of image. It is the *learned* ability to construct a visual image, to be able to distinguish characteristics, and to give meaning to what one sees.

In addition to these three areas of the vision process, there is a motivational factor that teachers must cope with in working with the deaf-blind child. Many of these children are reluctant to use their vision, and it is difficult to motivate them to do so. They have never used their visual senses and therefore do not miss seeing. In effect, they often have no need or desire to see. Such children must be taught to use visual skills and they must be *reinforced* when they succeed in using them.

[2]Natalie Barraga, *Increased Visual Behavior in Low Vision Children* (New York: American Foundation for the Blind, 1967).

Part III

Evaluating Visual Functioning

The purpose of visual evaluation is to determine the child's level of functioning in the areas of sensation, visual-motor, and visual perception. Such evaluation may be conducted by ophthalmologists, optometrists, psychologists, and teachers. The opthalmologist works primarily with the cause, treatment, and prognosis of the eye condition from a pathological point of view. The optometrist is concerned with the sensory and visual-motor skills. The psychologist is chiefly interested in the child's visual perceptual development. The teacher, on the other hand, must evaluate the sensory, visual-motor, and perceptual areas of vision and relate them to the child's learning experiences.

Because of the teacher's constant interaction with the child, he is in a position to provide the rapport and circumstances necessary for efficient evaluation. The regular school classroom — in some contrast to the clinician's office — provides a situation for eliciting maximum functioning of the child under observation. The classroom can be devoid of extraneous factors which may induce confusion and anxiety, both of which are detrimental to evaluating the child's performance.

This discussion is not intended to minimize the importance of evaluations by opthalmologists, optometrists, and psychologists; evaluations by these professionals are critically important to the teacher. But it is the teacher who must translate these findings into educational procedures that guide the learning of the child. Therefore, it is necessary for the teacher to correlate reports, supplement and implement professional evaluations, and initiate further investigative procedures.

Three general sources of information are available and necessary to the teacher. First, is the general sequence of development in normal children. Second, are reports from opthalmologists, optometrists, and psychologists, and finally, the educational evaluation by the teacher himself.

To begin with visual development in normal children, there is a pattern of skill development that most children follow. Although several writers have addressed the subject with some dif-

ferences in their observations, it is easy to assemble a vision developmental scale that applies to most cases. The present writers have performed this task and the resulting scale is found in Appendix A. The reader will note that the scale ranges from birth to about nine years of age in the normal child. Naturally, the deaf-blind child tends to deviate from this sequence of development, but understanding the pattern in normal children will be of great advantage in identifying and predicting status and progress in children with visual impairments.

The second source of information necessary and available to the teacher is the reports of professional persons who have evaluated the child. Because the observations are performed by persons in highly technical fields (ophthalmology, optometry, and psychology), the teacher often finds them cast in medical or psychological terms that may be beautifully complete but not particularly understandable to the teacher. The present writers, therefore, have proposed a questionnaire to be completed by the clinician that will provide the teacher with the information he needs but will do it in layman's language. The format for the questionnaire appears in Chart 1.

Chart 1

Educationally-Oriented Vision Report

1. What is the cause of the visual impairment?
2. Is any special treatment required? If so, what is the general nature of the treatment?
3. Is the visual impairment likely to get worse, better, or stay the same?
4. Should the teacher be alert to any particular symptoms (such as eye rubbing, etc.) that would signal the need for professional attention?
5. What restrictions should be placed on the child's activities?
6. Should the child wear glasses or contact lens? If so, under what circumstances?
7. Were you able to determine an accurate visual acuity measure? If so, what was the visual acuity of the child?
8. If a visual acuity measure was not possible, what is your opinion regarding what the child sees?
9. Is the child's focusing ability and eye muscle balance adequate? If not, please describe.
10. Were you able to determine the field of vision? If so, were there areas of no vision in the field? Where?
11. Was the child able to follow visually a moving object? Were there directions in which he could not track moving objects? Which directions?
12. Will the child work better with large or with small objects and pictures? At what distances?
13. What lighting conditions would be optimal for his visual functioning?
14. What are your specific recommendations concerning this child's use of vision in learning situations?
15. When should this child be examined again?

Although a questionnaire of the type offered in Chart I should enhance the teacher's understanding of the child's visual condition, there often will be a need to understand medical or optometric terms related to vision. A vocabulary of these terms appears in Appendix B.

A third and crucial source of information is the evaluations performed by the teachers. While these evaluations are generally quite informal, it is most important that they be both structured and recorded. Not only does structuring and recording the evaluations insure that all three areas of vision — sensation, visual-motor, and visual perception — are considered systematically, but a standard procedure makes it possible to perform periodic evaluations of the same child to determine progress. Such data are absolutely necessary to the systematic use and development of vision in the educational process.

The present writers have a format for guiding and recording vision evaluation of teachers which they believe can be useful in assembling necessary data. A complete copy of this "Teacher's Guide for Evaluating Visual Functioning" is presented in Appendix C. Explanations and instructions for the use of the guide form the topics for the remainder of the present section.

The evaluation guide is divided into the three major areas of vision: sensation, visual-motor, and visual perception. Under each of these three headings are items to be evaluated and recorded by the teacher. A discussion of these items follows below and on the next few pages in the same order as they appear in the evaluation guide.

Part I of the guide deals with the evaluation of sensation. Here the teacher is trying to determine whether light, form, and color are received by the retina and also how precisely the child is able to discriminate form (acuity). There are five items in this part of the evaluation guide. The first item is: "Is there a reaction to light"? At this point, the teacher is attempting to evaluate light awareness, generally with a penlight or candle. The child's reaction would include any observable change in behavior such as excitement, startlement, decrease or increase in activity, and/or gazing. Naturally, there are other reactions to light that the child might evidence.

A second item under sensation has to do with the use of colored light. Some children react to a greater or lesser degree to

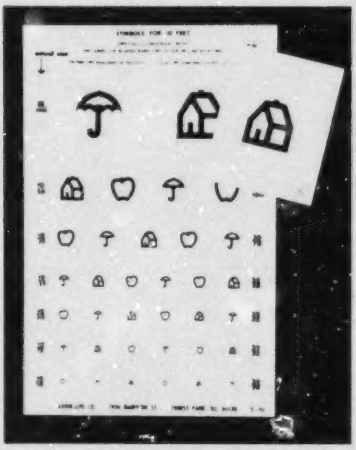
colored light than to white light, and this can be tested by using colored cellophane over a penlight. Any differences in the child's reaction between white light and colored light should be noted.

With many deaf-blind children, there are blank spots in their vision field. One significant cause of this is retinopathy (see glossary in Appendix B) due to rubella. The third item on the evaluation guide is to be used for identifying and recording such blank spots. Screening of the child's vision for possible blank spots can be thoroughly performed through using two penlights. The teacher holds one of the penlights directly in front of the child's eyes approximately twelve to eighteen inches away. The other penlight is held stationary in various other positions as represented by the two drawings under item three of the guide. Generally, the examiner starts on the outside of the vision field and moves around it in a clockwise position, gradually moving toward the center of the vision field. As the second light is moved to each new position, the first penlight — being held stationary directly in front of the eyes — is cut off and the second light cut on. If the child has no blank spot in his vision field at the point the second light is being held, he should make an immediate and accurate shift to the second light. So by holding one light constantly before the child's eyes, moving a second light through the various positions of the vision field, and alternately which is on and which is off; the teacher can identify blank spots and records them in the diagrams on the instrument. The teacher may follow the procedure, at first, with both eyes together and then each eye separately to determine voids in the visual field. The teacher should not feel that the entire evaluation for blank spots should be performed during one session; the evaluation may well be more reliable if done over a period of time involving several sittings. In the following picture, a teacher is evaluating a deaf-blind child for blank spots in her vision field.

The teacher should also be aware of any abnormal reaction of the child to the presence of light. This reaction is dealt with by item four under sensation and includes such reactions as gazing, flicking, head rolling, hand waving, object spinning, etc. This information may be correlated with that obtained from other examinations by specialists for determining the optimal lighting conditions under which the child should work.

The final variable to be evaluated under the sensation division is that of visual acuity. Here the teacher is attempting to determine how well the child discriminates detail at various distances; in other words, how well can he deal visually with form? With children whose functioning is fairly high, many excellent tests may be used, including the *Snellen Chart*, the "Tumbling E" Chart, picture matching charts such as the *Preschool Flashcard Test* (a photograph of this chart follows), and other techniques such as the *Stycar Test*.

With low functioning children standard procedures for measuring acuity are rarely reliable. Therefore, the teacher has to depend heavily on his own unstructured, and sometimes subjective, evaluations. For example, can the child discriminate a cup from a ball across the room when he is in need of a cup from which to drink? The teacher can make a judgement about his acuity at distance by observing the child's behavior in the situation.



Near-point acuity can be judged by the teacher through arranging situations in which the child is required to discriminate small objects which are desirable to him (candy, etc.) from more neutral objects (rocks, marbles, etc.). In cases of severe visual acuity, the teacher can observe whether the child is aware through visual means of things and people about him. For example, does the child respond to another person before or after he is spoken to or touched? Does he use tactile support in mobility and overall functioning? Does he use visual skills more or less than tactile skills in routine behavior? With severely impaired children, estimates of visual acuity naturally will vary in the degree of their accuracy. Nevertheless, the teacher should gain a fairly accurate understanding through recording this information over time.

Part II of the evaluation guide is concerned with visual-motor skills and contains eighteen items. These procedures have been organized and listed to assist the teacher in evaluating the child's oculomotor and focusing skills and his skill in coordinating his eyes with other parts of the body. The oculomotor skills involve the use of the six muscles attached to each eyeball for the purpose of aiming and coordinating the eyes with respect to the visual target. In the case of the normally sighted child, basic skills of oculomotor control are learned very early — generally in the first month or so of life. In the deaf-blind child, the situation is usually quite different and it is not unusual to find children five to ten years old who have not acquired these basic skills. Obviously,

oculomotor skills are critical because higher level vision skills such as visual perception depend on oculomotor efficiency.

The first item in this section of the evaluation guide is directed to determining oculomotor skills having to do with the child's ability to "track" or follow a light or object with his eyes. For children at all functioning levels, either a penlight or a candle may be used as a target for the procedure. The light should be held about sixteen inches from the child's eyes and moved slowly from left to right and from right to left. The results should be recorded in the appropriate blanks on the evaluation guide. Then the light should be moved up and down and down and up, then at both diagonals and finally in a circle with a diameter of approximately sixteen inches. The procedures should be followed with both eyes working together and then with each eye separately. Of course, the job of the teacher is to observe the efficiency of the child in following the light. If the child loses the target, the teacher should immediately stop, blink the light (if a penlight) until the child reestablishes contact, and then proceed with the evaluation. The teacher should note the number of times contact was lost and at what positions. It is also important to note whether the child's movements in following the target light were smooth or erratic and whether he moved his head rather than his eyes in following the target. The teacher should be cautious in using a blinking light with seizure-prone children.

The second and third items in the second deal with determining the child's convergence skills. Convergence is an individual's ability to follow a moving target as it proceeds toward him. Using a penlight or a toy as the target, the examiner should start about sixteen inches away from the eyes and slowly bring the target toward the bridge of the child's nose until it is only about four inches away. The teacher should observe and record whether the child is able to follow the target smoothly, if one eye turns out, or if the child is uncomfortable at seeing an object at such a close distance. Typical reactions include the child turning his head away or pushing the object away from him. The general procedure for evaluating convergence can be used with children at all visual functioning levels.

The next six items have been designed to serve as indicators of the child's accommodation skills. In this sense, accommodation refers to the ability to focus comfortably on an object near at

hand and at what distance and position from the eyes the object must be placed for the child to see it most efficiently. The teacher may hand the child a toy or some other object attractive to him. The teacher then determines whether the child is looking at the object he is now holding, at what distance he is holding it, and at what angle he is holding it. The issues are whether the child is holding the object to one side or the other, or close to his face and whether or not the child is using one eye more than another.

Another procedure which may be used is to have the child look at a light or some attractive distant object followed by quickly covering the distant object and exposing or illuminating a nearby object. The teacher should observe how quickly and accurately the child is able to change his attention or focus. It is also important to determine whether the child can maintain eye contact with the examiner and with an object and for how long he can maintain this contact.

Another indicator of tracking is the child's reaction to an object being slowly moved across his midline. The teacher should observe whether the child's visual tracking is jerky or intermittent or fairly smooth. In observing and recording the child's behavior in each of the six situations or tasks, the teacher is able to gain an extensive and fairly valid estimate of the child's motor skills.

The remaining nine items in the visual-motor section of the guide are concerned with the child's coordination of his vision with other parts of his body. In evaluating these skills, it is helpful to remember that a normally seeing child's gross and fine motor coordination is greatly enhanced by visual support. Therefore, the greater the visual impairment, the slower the motor development of the child is likely to be. In the case of eye-hand coordination, visual support helps the child determine how far away an object is and in which direction it is. The daily practice that the normal child gets helps him to build accuracy in grasping techniques. And naturally, daily practice contributes to the development of his confidence.

Of course, the case is quite different with visually impaired children. Therefore, knowing the speed and accuracy with which the child can grasp objects is important information to the teacher. His level of efficiency may be judged by placing a desirable

object in front of the child and observing the skill with which he obtains it. Particular note should be made of whether he reaches for it immediately, whether he reaches in the right direction, and whether he is accurate in his judgement of how far away the object is from him. This information is recorded in item ten of the guide.

Mealtime is an excellent situation in which to evaluate the visual-motor skills of deaf-blind children. The teacher should note the child's skills at picking up his food with a spoon or fork, his need for tactile clues in eating, and the smoothness with which he replaces cup or glass on the table surface.

Visual-motor skills may also be evaluated effectively through observing the child's mobility behavior. The questions are: "How skillful is the child at judging distances?, Does he depend more on tactile clues than on visual clues?" Item twelve deals with the child's ability to accurately place items in a container. This is another test of his ability to make distance judgements.

The teacher may also evaluate eye-motor coordination through observing the child's performance in climbing stairs, catching balls, and kicking balls. Here it is necessary for the child to use his vision to determine how many steps are in front of him, how far to lift his foot, where to put it down, and how he must move to catch the ball. All of these evaluations may be conducted in informal settings and all can produce invaluable indications of the child's levels of performance. This information is recorded in items thirteen, fourteen, and fifteen of the evaluation guide. The remaining items allow the teacher to assess and record the child's performance in pointing to body parts, finger painting, scribbling, drawing recognizable pictures, coloring within lines, and cutting straight lines.

The final section of the teacher's evaluation guide involves evaluating the visual perception of the child. In assessing visual perception, the task is to determine how much the child has gained and retained from his visual experiences. This determination is accomplished, in effect, by observing to what extent everything the child sees makes sense to him. And it is important to note that this visual perception depends on the other two areas of vision already discussed — sensation and visual-motor. The reason is that sensation is necessary to build visual skills which

are in turn enhanced by visual-motor experiences. Cumulatively, these elements produce and determine the level of functional visual perception. Nine items have been included in this section for assisting the teacher in evaluating the child's level of visual perception.

Particularly in the case of low functioning children, valuable clues to visual perception can be obtained from observing how well they know the meaning and use of everyday objects such as cups, spoons, chairs, etc. This can be determined by the teacher's observing how consistently and appropriately the child uses these items.

In evaluating the accuracy of perception, the teacher is attempting to determine how well the child attends to the details of shape, color, and size. With medium to low functioning children, the form board is a useful evaluation tool; with higher level functioning children, exercises in picture matching are effective. For even higher functioning children, the *Slosson Drawing Coordination Tests for Children and Adults* may be used. Also, some reading readiness tests may be adapted for the higher functioning child to evaluate his level of visual perception. A closely related exercise that can supplement those already mentioned is color matching. The extent to which children can match colors in games and exercises provides additional and important evaluation data.

The assessment of visual memory is another important element in evaluating a child's level of visual perception. The goal here is to determine how accurately the child remembers what he has seen on earlier occasions. One procedure that can be used with very low functioning children is that of having the teacher take a toy away from a child and hide it, perhaps under a bowl, while the child is watching. The issue then is: "Does the child attempt to lift the bowl and get the toy or does he seem to think the toy has just 'disappeared'?". Other exercises for evaluating visual memory are: (1) determining if the child remembers how pegs are to be placed in a board after several practice sessions, (2) if he is able to copy designs made of blocks after they have been disassembled, and (3) if he can remember other repeated visual activities without being shown again each time how they are to be done.

Item five deals with figure-ground confusion on the part of the child. Figure-ground confusion occurs when the child con-

fuses the object with which he is working with other objects in the background of his activity. For example: "Does the child place pennies in a bottle better when each penny is given to him separately or when he is given a handful of pennies at the same time?". When working with a form board: "Does the child work better when all but one shape is covered or when all shapes are left visible?" During letter-matching activities: "Is the child better able to match a letter when only one is exposed at a time or against a whole row of letters?". When working with high functioning children, commercial tests are available for identifying figure-ground confusion problems. Two of these are the *Frostig Developmental Test of Visual Perception* and the *Motor-Free Visual Perception Test*.

The notion of visual directionality is another element crucial to the concept of visual perception. Generally, low functioning children will do poorly on tasks requiring skill in visual directionality. The teacher may observe their levels of development in this area by closely observing their body movements as they play games like "Simon Says". With higher functioning children, those sections of reading readiness tests dealing with directionality can be used, as well as a close inspection, by the teacher, of directional mistakes in the pictures that the children draw or finger paint. Additionally, the *Motor-Free Visual Perception Test* has items that evaluate directionality skills.

The final two items on the evaluation guide have to do with the child's ability to duplicate visual stimuli presented to him by the teacher and his ability to recognize common elements through matching letters. Careful attention to the nine items in the visual perception section of the guide should provide the teacher with considerable insight as to the amount of information and skills the child has gained and retained from his visual experiences.

In addition to the skills reflected by the items comprising the *Teacher's Guide for Evaluating Visual Functioning*, two special problems warrant special attention and consideration as the teacher evaluates the deaf-blind child's vision. These problems are strabismus and nystagmus. Strabismus is a condition in which the eye turns in, out, up, or down. The eye affected is supressed which means that the brain "turns off" the image from the affected eye in order to avoid double vision. When the unaffected eye is covered, the turned eye will usually correct it-

self, and the brain immediately receives visual messages from that eye again. During visual evaluation, the teacher should still perform the oculomotor evaluation procedures, but he should note the special eye condition.

Nystagmus, on the other hand, is a constant, uncontrolled rapid movement of the eyeball caused by a neurological condition. All children with albinism have nystagmus. Generally, children with this condition have decreased visual acuity and usually the acuity can be improved through magnification. The teacher should follow the same oculomotor evaluation activities with these children, but the teacher should also recognize that the eyes cannot be trained to reduce their rapid movement. Of particular importance for the teacher is keeping in mind that the child perceives objects as being stationary even though his eyes are moving rapidly.

Part IV

Techniques and Materials for Improving Visual Functioning

Introduction.

In preceding sections of the present volume, visual functioning in deaf-blind children and the evaluation of visual functioning in these children have been discussed. In each case, visual functioning has been discussed in terms of sensation, visual-motor, and visual perception. This final major section will deal with techniques and materials that teachers may find useful in assisting the development and learning of children with these particular visual problems.

In terms of long-range planning and daily classroom activities, the argument must be made that vision development must receive high priority. The basic reason for this argument is the fact that efficient visual functioning is a basic requirement for successful functioning in the other areas such as self-help, motor, cognitive, and social development. Of course the teacher's workday is already filled with high priority items, and the suggestion is not being made that a great deal of time be spent on vision exclusively. Instead, the techniques being suggested on the following pages are of such a nature as to be readily blended into all areas of the instructional program. Obviously, these techniques represent no panacea and they will not apply to all deaf-blind children. Modifications based on individual situations and programs will be required, but they may lead to expansion and stimulation.

The suggestions will follow the same order and utilize the same categories as used in the previous sections: sensation, visual-motor, and visual perception.

Sensation

The development of the sensory area of vision is basic to any further development of visual functioning. Because this development is so basic, the discussion of teaching activities will be primarily concerned with the low functioning child. The reason is that one can assume that the high functioning child has advanced beyond the sensory level of development. The teaching activities

suggested in the present section include: (1) techniques for helping the child to be made aware of and to respond to light, (2) techniques for working with the child who responds abnormally to light, and (3) suggestions for helping the child function most efficiently at his present level of visual acuity.

In working with deaf-blind children, light (if it is pleasing to the child) is a most powerful tool. It may be used as a reward in developing the sensory areas as well as many other areas of vision both directly and indirectly. For the child who does not seem to be aware of the stimulus (he does not respond to light), several techniques may be used. However, an evaluation of the child's visual field should be reviewed prior to using any of the techniques. Greater success will be achieved and the child's chances of responding will be greater if the teacher first concentrates on the activities in the areas of the child's known usable vision and later expands them.

The use of light stimulation does not have to be (and should not be) limited to one type of light source. If the child responds better to a bright light, a penlight should be used. If he seems to prefer a softer light, a dripless candle often works very well because of its fascination to the child. The candle is not as safe or as practical as the penlight, however. Christmas tree lights often have been found to be successful. They may be strung near the child which is especially helpful if the child is in a bed or crib much of the time. Many children respond better to blinking lights than to a continuous light source, but care should be taken here in the case of seizure-prone children.

Many children respond better to colored light than to white light. Training in this area may be accomplished by placing colored cellophane over the penlight. If the child prefers a certain color, use it frequently, but not exclusively. Other types of light to which the child may respond differently or to a greater degree include light reflected in a mirror, a camera flash, etc. Once again, it is important to keep in mind the child's areas of usable vision. The child's response to light will be the basis of much training in the other two areas of vision development.

The following techniques are suggested for the child who shows abnormal reactions to light such as light gazing or object flicking. If possible, substitute overhead lighting with indirect,

subdued light in order to reduce competition between light sources. When the child is in direct sunlight he should be prevented, as much as possible, from looking directly at the sun because it may do permanent damage to his retina.

When working with the child who has abnormal reactions to light, the teacher's task is to teach him to use light productively for purposes other than self-stimulation. It would be most helpful and useful for the teacher to take the positive rather than negative approach. In other words, appropriate application of the behavior should be reinforced rather than extinguishing the behavior by punishment. Many children in a purposeful light stimulation program have greatly reduced their self-stimulatory behavior. Because light is such an effective tool for the teacher to use in further developing the other areas of vision, it should be used in conjunction with accepted educational techniques to shape the child's behavior and give him the opportunity to progress beyond the level of self-stimulation. In other words, the teacher should use light as a reward for these children when they do such things as establish eye contact with the teacher or an object, or when they reach out and grasp something they want. The suggestion is not being made that the positive approach will work with all children, but it should be given the greatest effort before extinguishing behavior by negative means.

Another important point in the area of light training has to do with medical reports. Many times the teacher receives reports that the child is totally blind. If, from the teacher's experience, the slightest doubt exists that this is true, the teacher should not hesitate to begin light training. If a reaction is observed from the child, the teacher should not hesitate to contact the doctor and possibly work together on a second evaluation.

Of major concern in sensory training is acuity; that is, the development of the child's awareness of details. The suggested techniques will differ from those named above in that non-illuminated objects are used instead of light. An acceptable alternative, however is that of shining light on the object. This activity may be used if it proves to be more effective for the child.

Developmentally, children usually acquire near-object acuity before distant-object acuity. Of importance here is that a child's measurable visual acuity is limited. The teacher's efforts are

directed to what the child does see and how well he functions with the vision that he has.

For the low-functioning child, the objective is that he become aware, visually, of people and objects near him. Then gradually, he should become aware of people and objects at increasing distances from him. Of major importance in planning activities is the fact that the child may not see large objects better than small ones.

For the child who is able to see objects near him, the teacher should attempt to refine the child's discriminations of size, shape, and color. This may be accomplished by presenting the child with situations in which he must discriminate objects in order to choose the object he wants. For example, place a cookie (or favorite object) and a block in front of him. He will have to recognize these objects before he can obtain the one he wants. An alternative would be to present the child with a flashlight (switched off) and a block. Once again, it is very important that the teacher work within the child's visual field.

When the child is able to discriminate at near point, the teacher may then introduce the object to the child at a greater distance from him. If the object is a cookie or a toy, he will learn to discriminate it in different positions and at different distances. Another alternative is to take candy or something that the child likes to the wall or to hang it from the ceiling. The locations should be changed at each presentation, however.

For the higher level child, visual acuity may already have been developed to some degree. This development is indicated by the following skills: (1) ability to work a form board (with handles, then without), (2) progressing from a picture form board (same shape, different pictures), to picture matching, (3) matching letter to letter, symbol to symbol and so on. In demonstrating visual acuity, the child should be able to hold up a letter or picture to match the one that the teacher shows from across the room.

Visual-Motor

In the area of sensation, methods and sequential techniques were cited for developing both the child's awareness and his discrimination of light and objects. In the area of visual-motor development, the purpose is to raise his level of development by

helping him develop oculomotor control, focusing ability and eye coordination with other parts of his body. All of these skills are essential for visual perception. The following teaching activities are suggested techniques with which the teacher may assist the child in developing efficient visual-motor skills.

The first level in the visual-motor area is the ability to track a moving target. Basically, the training is conducted in the same manner as the evaluation. Once again, one should consider both the child's visual field and color preference. As in evaluation, the teacher will move a light or object the child likes in various directions. The object should be a distance of about 16 inches from his eyes (depending on his vision), and should be moved first from right to left, then left to right, top to bottom and bottom to top, at both diagonals and finally, in a circle, (16 inch diameter). This activity should be accomplished first using both eyes together and then each eye separately. If necessary, the child's head may be gently held stationary so that he can follow with his eyes and not his head. Caution should be taken to move the object *very* slowly so that the teacher may observe if the child is following the object. Should the child lose eye contact with the object, the teacher should stop until the child again regains contact. This process may often seem very slow but the child will show progress as he gains strength and control. Like all exercises, this activity should be used regularly, at least three times a week and preferably, every day. In the beginning, the sessions should be short and the time gradually increased. The teacher should experiment with different types and colors of lights and objects, keeping in mind the child's visual field and special eye conditions such as strabismus.

For convergence training, the same type of light or object as in tracking is used. The child should follow a target that first moves toward him and then away from him. The object should be moved very slowly and the teacher should note at what point the child is no longer following. A cookie or favorite food may be used and the child may then be allowed to eat the food for a snack or lunch. Ideally, the child should follow the object with both his eyes until it is four inches from the bridge of his nose. The skill that is being developed is convergence which may be affected by the child's visual field and/or special eye problems. The purpose of these techniques is to have the child work and coordinate both eyes together. The teacher should note that a darkened room will

often produce better results if a light is used. This situation provides contrast and the child will not be distracted by overhead lights.

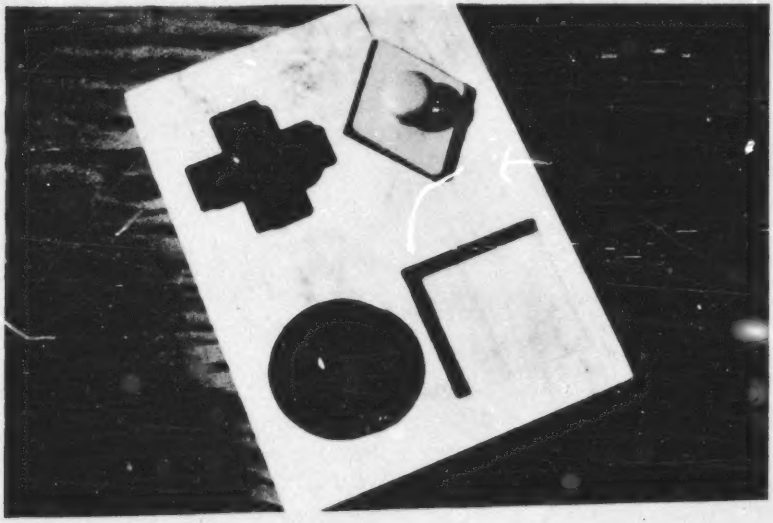
The next highest level in the area of visual-motor development is accommodation. Basically, in developing this skill, the teacher is assisting the child in focusing on objects as they change distance from his eyes. The following techniques are suggestions regarding accommodation, taking into consideration the information learned from evaluation of this skill. If the child focuses on an object three inches from his eyes, the idea is to increase his flexibility while remaining comfortable as the distance increases from his eyes. The purpose is expanding his area of visual effectiveness.

Perhaps one of the most important skills of visual-motor development is the establishment of good eye contact with another person and, secondly, with objects. This skill is very essential to his development in other areas because many of the other levels depend on this skill, e.g., eye-hand coordination and all the areas of visual perception. In addition, the ability to relate to another person and basic eye contact with a person are of major importance. Many deaf-blind children appear to be almost stubborn in regard to eye contact. Socialization and other skills such as imitation and following directions utilize this skill, however. Eye contact is certainly one skill that is not limited exclusively to visual development but carries over into all other areas of development.

A very basic technique in developing eye contact is for the teacher to sit across from the child (on the floor or chair) and hold something the child likes at the bridge of his nose. In order to earn the reward, the child has to look up at the teacher's eyes. Although this activity is a specific training activity, it can and should be carried over into all other activities. The teacher should keep in mind that the child's eye contact is not restricted to his looking directly at the teacher. He may have to look at the teacher at an angle, turning his head a little depending on his best area of vision.

Eye contact with an object is one skill that may be developed all day, every day, in all of the teacher's activities with the child. One should remember that if the child does not look at an object,

it does not mean that he cannot see it, but probably he has never had to see it. The teacher should never just put an object or food in the child's hand. He should be required to look at it before it is given to him. This practice is illustrated in the picture shown below.



In many situations, people have done all the "looking" for the child by putting things in his hand, taking him by the hand to take him places, etc. These suggestions here may seem to be extremely simple. Yet, they are neglected because it is easier and faster for individuals to "look" for the child.

Another skill related to looking at an object that the child may have difficulty with is that of being able to follow an object moving across his midline. The reason is that the child has difficulty switching from one side to another and it causes confusion. Activities such as trampoline, balance beam, finger painting, or drawing a line from left to right will help the child.

In working on the development of eye contact with objects, the teacher should be careful to work within the child's area of usable vision and also consider using light as reward.

The next highest level in the visual-motor is the establishment of eye coordination with other parts of his body (hand,foot).

When the child looks at an object, the next goal is for him to reach out and grasp it. This skill is one that may be developed in all other activities during the day. If the child is being given a cookie or cup of juice, he should be required to reach out and grasp it. When the teacher is working with different materials such as blocks or a form board, he should make the child reach for it before he begins using it. Eye-hand coordination can be developed in almost all of the activities that a child engages in. For the lower functioning child, this skill is evidenced by his ability to pick up a cup and put it down again. If the child has very little eye-hand coordination, one might begin by having him reach for a penlight or object that he desires. A variation of this technique is requiring the child to reach for bubbles that the teacher is blowing, to hit a balloon that is hanging from the ceiling, to catch a ball, and so on.

For the middle functioning child, activities such as lacing, stringing beads, building with blocks, pegboards, puzzles, using a crayon and other similar activities are all practical ways of building this skill. The teacher should progress from activities requiring less motor control (form board) to those requiring more motor control (stringing beads), always keeping in mind the child's visual field.

The higher functioning child generally has developed these skills, as indicated by his drawing, printing, cutting along a line, etc. If a deficiency is observed in this area, review the tasks being used and make them easier motorically. In other words, change the size of the objects or symbols or add more contrast to the colors involved.

In addition to eye-hand coordination, the teacher will also be concerned with eye-foot coordination. This skill is evident in the child's ability to climb stairs, to kick a ball, etc. One excellent way of developing eye-foot and eye-motor coordination is by use of an obstacle course which may be arranged differently each time. Items already in the room (chairs, tables, barrels) may be used, both upright and on their side so that the child goes above, below, around, etc. Eye-foot coordination may also be developed by having the child walk on a board or a line of wide tape on the floor.

Underlying all of these specific eye-motor skills is the basic ability of body awareness or perception which is so important for

the child in his visual development as well as for his overall functioning as a person. Often, the visually impaired child does not develop this awareness as the normally sighted child does with the exploration of the different parts of his body early in infancy.

A lack of body awareness is particularly noticeable in the low functioning child. One technique which is effective is the use of mirrors. The child may be placed near a wall in front of a long mirror so that the child will be able to see not only his face and hands but all of his other body parts. If a textured or fuzzy material is placed under him, he can feel the different parts as he moves. One might also put bright objects or bells on his different body parts or shine lights on them to help him notice them. Body awareness is one area of vision that is especially conducive to coordination with other senses, especially the tactile. In all the other levels of visual development, use should be made of auditory, tactile, and other senses if cues from these senses will help the child function more efficiently visually.

Visual Perception

The development of visual perceptual skills is dependent on the development of skill in the other areas of vision. In the development of visual perception, the teacher is assisting the child in deriving as much meaning as possible from what he sees. Efficient visual perceptual functioning includes several components. The following activities are techniques for developing and refining these skills.

The first level concerns the accuracy of perception. In other words, initially the child should be aware of gross differences and then he should be able to discriminate details. This skill applies particularly to higher functioning children as they begin to refine their discriminations of symbols, pictures, sizes of shapes, etc. A technique for developing this skill would be the use of tasks in which the child matches drawings of different sized objects with their corresponding concrete objects (TRY program). In picture matching activities, the possible choices become more and more difficult to discriminate so that the child becomes aware of inner detail. If the child is copying designs, they should be made more and more complex.

For lower and middle functioning children, the teacher should use situations in which the child chooses an object he wants from

two things (e.g., a cookie and a block). Gradually, the discriminations should become more difficult. For example, he would be required to choose between a chocolate chip cookie (his favorite) and a raisin cookie (that he doesn't like at all).

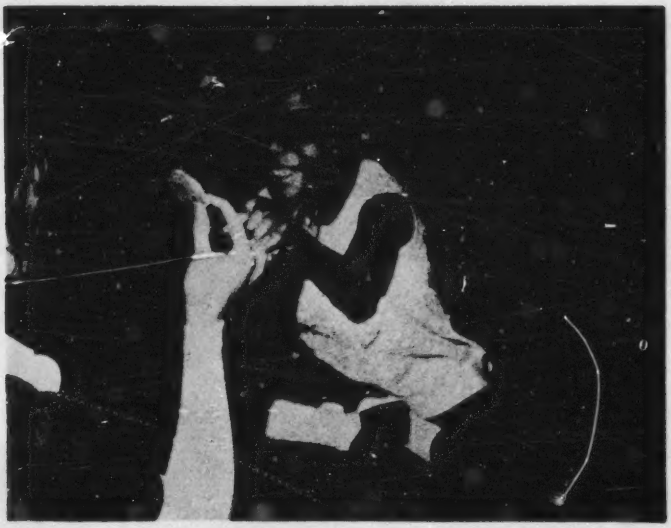
The second component is rate of perception. The activities are the same as the ones for accuracy of perception; however, the purpose is for the child to need less and less time in making discriminations.

The third component is directionality which is related to cognitive development. Therefore, lower functioning children will generally be poorer in this area. One method of developing this skill is the use of activities that involve directed body movements. Imitation games, such as "Simon Says", are an example.

A basic technique that may be used in helping the child develop directionality is always going from left to right, top to bottom in all the activities he does such as pegboards, form boards, matching activities, etc.

The fourth component of vision perception is figure-ground confusion. Suggestions for eliminating figure-ground confusion may be applied to all activities with all levels of children. Many times a child is presented visually with more than he can handle at one time. Many times a task presented to the child appears cluttered to him so that what the task is requiring of him is not clear. For example, when a child is presented with a pegboard, often he is confused by all the holes. One alternative is to cover part of the peg board so that the child doesn't have to visually process the whole peg board at once. This technique is particularly applicable to form boards. Very often the child is confused by seeing all the shapes and colors at once. Success is often increased when the form board is covered except for the one position where the particular shape should be placed. The difficulty of the task may be increased by uncovering two shapes and so on, as shown on the following page.

The basic concept underlying figure-ground discrimination is the development of the child's ability to focus on one object and not be confused by an excess of extraneous background. In preparing activities such as color or letter matching, the teacher should keep in mind that it is much easier for the child to match



a letter when he has a choice of two letters in front of him than if he has a page of letters. The clearer and more direct the task, the more successful the child will be.

In conjunction with figure-ground discrimination is the use of *contrast*. Contrast refers to the use of colors for emphasizing what the child is to see. For example, black on white is much better than light pink on light blue. If a floor or table of neutral color is used, a black or white paper under the objects will make them more obvious and therefore easier for the child to process.

The last and highest level of visual perception is *visual memory* which refers to the child's ability to remember what he has seen. For the lower functioning child, one begins developing this skill by making him aware of object permanency. In other words: "Does the child think something just disappears when it is no longer in his sight?" In training, one begins by partially hiding a cookie or something the child likes under a cup or other object and then having the child notice it and retrieve it. In successive presentations, the cookie is placed more and more under the cup until the cup completely covers it, and it is necessary for the child to lift the cup to get the cookie. As part of the classroom

routine the teacher should use "hide and seek" type of games in which candy or favorite objects are hidden around the room and the child is required to find the object. Helping the child gain experience in dealing with mechanical objects is a good addition to his visual memory experiences. Other activities that aid visual memory include remembering cues such as plastic aprons before finger painting and that a bathing suit means swimming. It is good for the child to be able to remember what will happen after he sees certain cues.

For the middle functioning child, one can build a block design then disassemble it, and then require the child to complete the same activity. Because this task involves delayed imitation, it may be difficult for the child who is used to imitating immediately.

Sequence is a skill related to visual memory. One can help the child develop sequence by such activities as duplicating the order in which beads are strung and following the sequence of colored pegs in a pegboard, etc. For the high functioning child who is ready, or may be ready, for reading, many commercial reading readiness programs are available which deal with vision perception in general. Also available are the workbooks from *Frostig*. Other excellent programs are the *Michigan Tracking Program* and the *Michigan Language Program*.

Conclusion.

The visual functioning of a deaf-blind child needs to be developed to its maximum in order for the child to achieve his potential. Although the visual sense for many of these children will never be their primary mode of learning, it still must be stimulated so that it may work in conjunction with and in support of the other senses.

The present guide was composed to assist the teacher in understanding the deaf-blind child's vision, in evaluating his level of visual functioning and in providing techniques and materials to remediate his visual deficiencies as much as possible.

The appendices include a visual developmental scale, a glossary of technical terms related to the eye and vision, a teacher's guide for evaluating visual functioning in deaf-blind children, and a labeled diagram of the eye. While the authors are hopeful that

these materials will prove useful to the teachers for which the manual was intended, they are of the opinion that the teacher's guide to evaluating the visual functioning of deaf-blind children is perhaps the most significant and useful of the materials here offered.

Appendix A

Visual Development in Normal Children — A Composite Scale

A Visual Developmental Scale

Developmental scales are useful to teachers because they outline the visual development in the average, normal child from birth to mature visual functioning. Although the deaf-blind child may not follow this pattern in any exact way, predictions concerning successive levels may be made. Of course, such information is valuable to the teacher as he plans the child's instructional program. The visual scale which follows is a composite of the *ESS-USM*, Ellisville, Mississippi; the *Callier-Azusa Scale;* Arnold Gessell's *Vision — Its Development in Infant and Child* (Harper, 1949); and C. A. Brown's "The Development of Visual Capacity in the Infant and Young Child," *Cerebral Palsy Bulletin*, August, 1961.

Age	*Visual Characteristics or Skills*
0 month	—does not attend to any stimulus in the visual field except light
	—some degree of fixation
1 month	—follows slow moving objects
	—begins binocular coordination
2 months	—attention to objects up to 6 feet away
	—prefers faces to complex patterns
3 months	—eye movements becoming smoother
	—visual acuity improving: glances at small object one inch in diameter
	—binocular vision improving
	—notices crude color differences
	—seems aware of objects only when manipulating them
4 months	—eyes focus on hand and eyes may shift focus
	—interest in small, bright objects
	—smiles at moving faces
	—attempts to move toward object in visual field
5 months	—eye-hand coordination development: successful efforts at grasping
	—looks intently at objects held close to eyes

Age	*Visual Characteristics or Skills*
	—examines objects with eyes rather than using objects only for light play
6 months	—shifts visual attention from one object in a field of two or more objects
	—recognizes faces up to six yards away
	—rescues toy dropped within reach
	—rolls eyes easily to extreme right or left
7-8 months	—manipulates objects: shaking, banging, etc.
	—attempts to secure objects beyond reach
	—both eyes hold and converge equally
	—turns object in hand and explores visually
9 months	—can see tiny pieces of paper (2-3 mm.) lying near him
	—closely observes expressions on faces and tries to respond with same
	—picks up 7 mm. pellet
1 year	—far and near acuity good
	—binocular vision stronger
	—focus and accommodation
1½ years	—vertical orientation: builds tower 2-3 blocks
	—matches identical objects: 2 spoons, 2 blocks, etc.
	—points to picture in a book
2 years	—inspects objects with eyes alone
	—imitates movements of others
	—visually seeks missing object or person
3 years	—matches simple forms, does simple form board or puzzle that still relies on some tactical clues
	—pretends to pick up object from page of book
	—can draw crude circle
4 years	—can make accurate size discrimination by matching identically shaped objects by size
	—good depth perception
	—free eye-hand coordination

Age	*Visual Characteristics or Skills*
5 years	—mature coordination: picks up and releases objects precisely
	—colors, cuts, pastes
	—large muscle control superior to fine
	—demonstrates concept/muscle control of size by assembling nesting blocks with facility, not trial and error
	—can draw a square
6 years	—handles and attempts to use tools and materials
	—prints capital letters but has common reversals
	—can draw a triangle
	—begins to read
7-9 years	—prints sentences
	—speed and smoothness of eye-hand preference
	—details in drawing

Appendix B

A Glossary of Terms Relating to the Eye and Vision

A Glossary of Terms Relating to the Eye and Vision

Accommodation: the adjustment of the eye for seeing at different distances, accomplished by changing the shape of the crystalline lens through action of the ciliary muscle thus focusing a clear image on the retina.

Albinism: an hereditary loss of pigment in the iris, skin and hair, usually associated with lowered visual acuity, nystagmus and photophobia and often accompanied by refractive errors.

Amblyopia: dimness of vision without any apparent disease of the eye.

Amblyopia Ex Anopsia: dimness of vision due to disuse of the eye.

Ametropia: a refractive error in which the eye, when in a state of rest, does not focus the image of an object upon the retina; includes hyperopia, myopia and astigmatism. See Refractive Error.

Aniridia: congental absence of the iris.

Aniseikonia: a condition in which the ocular image of an object as seen by one eye differs in size or shape from that seen by the other eye.

Anophthalmos: absence of true eyeball.

Anterior chamber: space in front of the eye, bounded in front by the cornea, behind by the iris; filled with aqueous.

Aphakia: absence of the lens of the eye.

Aqueous: clear, watery fluid which fills the anterior and posterior chambers within the front part of the eye.

Asthenopia: eye fatigue caused by the tiring of the internal or external muscles.

Astigmatism: refractive error which prevents the light rays from coming to a single focus on the retina because of different degrees of refraction in the various meridians of the eye.

Binocular vision: the ability to use the two eyes simultaneously to focus on the same object and to fuse the two images into a single image which gives a correct interpretation of its solidity and position in space.

Blepharitia: inflammation of the margin of the eyelids.

Blindness: In the United States, the legal definition of blindness is: central visual acuity of 20/200 or less in the better eye after

correction; or visual acuity of 20/200 or more if there is a field defect in which the widest diameter of the visual field subtends an angle distance no greater than 20 degrees. Some states include up to 30 degrees.

Buphthalmos: large eyeball in infants-generally due to secondary glaucoma.

C,CC: with correction, wearing prescribed lenses.

Canal of Schlemm: circular canal situated at the juncture of the sclera and cornea through which the aqueous is excreted after it has circulated between the lens and the iris and between the iris and the cornea.

Canthus: the angle at either end of the slit between the eyelids; specified as outer or temporal, inner or nasal.

Cataract: a condition in which the crystalline lens of the eye, or its capsule, or both, become opaque with consequent loss of visual acuity.

Central Visual Acuity: Ability of the eye to perceive the shape of objects in the direct line of vision.

Chalazion: inflammatory enlargement of the melbomian gland in the eyelid.

Chorioretinitis: inflammation of the choroid and retina.

Choroid: the vascular, intermediate coat which furnishes nourishment to the outer parts of the eyeball.

Choroiditis: inflammation of the choroid.

Ciliary Body: portion of the vascular coat between the iris and the choroid. It consists of ciliary processes and the ciliary muscle. See Uvea.

Coloboma: congenital cleft due to the failure of the eye to complete growth in the part affected.

Color Deficiency: diminished ability to perceive differences in color — usually red or green, rarely blue or yellow.

Concave lens: lenses having the power to diverge parallel rays of light, also known as diverging, reducing, negative, myopic or minus lens, denoted by the sign "—".

Cones and Rods: two kinds of cells which form a layer of the retina and act as light receiving media. Cones are concerned with visual acuity and color discrimination; rods with motion and vision at low degrees of illumination (night vision).

Congenital: present at birth.

Conjunctiva: mucous membrane which lines the eyelids and covers the front part of the eyeball.

Conjunctivitis: inflammation of the conjunctiva.

Contact or corneal lens: lenses so constructed that they fit directly on the eyeball; used for the correction of vision in cases having a cone-shaped cornea and for cosmetic reasons. Corneal lenses are also used after cataract extraction to replace the lens removed from the eye. They provide less distortion and image size difference between the eyes than spectacles would.

Convergence: the process of directing the visual axes of the two eyes to a near point, with the result that the pupils of the two eyes are closer together. The eyes are turned inward.

Convex lens: lenses having power to converge parallel rays of light and to bring them to a focus; also know as converging, magnifying, hyperopic or plus lens, denoted by sign "+".

Cornea: clear, transparent portion of the outer coat of eyeball forming front of aqueous chamber.

Corneal Graft: operation to restore vision by replacing a section of opaque cornea with transparent cornea.

Crystalline lens: a transparent, colorless body suspended in the front of the eyeball, between the aqueous and the virtreous, the function of which is to bring the rays of light to a focus on the retina.

Cyclitis: inflammation of the ciliary body.

Cycloplegic: a drug that temporarily puts the ciliary muscle at rest and dilates the pupil; often used to ascertain the error of refraction.

Cylindrical lens: a segment of a cylinder, the refractive power of which varies in different meridians; used in the correction of astigmatism.

Dacryocystitis: inflammation of the lacrimal sac.

Dark Adaption: ability of the retina and pupil to adjust to a dim light.

Depth Perception: the ability to perceive the solidity of objects and their relative position in space.

Diopter: unit of measurement of strength or refractive power of lenses.

Diplopia: the seeing of one object as two.

Duction: a stem word used with a prefix to describe the turning or rotation of the eyeball (abduction—turning out, adduction—turning in).

Dyslexia: inability to read which is apparently due to a neurological problem.

Ectropion: an eversion or turning inside out of the eyelid.

Emmetropia: the refractive condition of the normal eye. When the eye is at rest, the image of distant objects is brought to focus on the retina.

Endophthalmitis: inflammation of most of the internal tissues of the eyeball.

Entropion: a turning inward of the eyelid.

Enucleation: complete surgical removal of the eyeball.

Esophoria: a tendency of the eye to turn inward.

Esotropia: a manifest turning inward of the eye (convergent strabismus or crossed eye).

Exophoria: a tendency of the eye to turn outward.

Exophthalmos: abnormal protrusion of the eyeball.

Evotropia: abnormal turning outward from the nose of one or both eyes (divergent strabismus).

Extrinsic Muscles: external muscles of the eye which move the eyeball. Each eye has four recti and two oblique muscles.

Eye Dominance: tendency of one eye to assume the major function of seeing, being assisted by the less dominant eye.

Eye Grounds: see Fundus.

Field of Vision: the entire area that can be seen without shifting the gaze.

Floaters: small particles consisting of cells or fibrin which move in the virtreous.

Focus: point to which rays are converged after passing through the lens. Focus distance is the distance rays travel after refraction before focus is reached.

Fornix: a loose fold of the conjunctiva where the part covering the eyeball meets the conjunctiva lining of the eyelid.

Fovea: small depression in the retina at the back of the eye; part of the macula adapted for most acute vision.

Fundus: the back of the eye which can be seen with an opthalmoscope.

Fusion: the power of coordinating the images received by the two eyes into a single mental image.

Glaucoma: increased pressure inside the eye; "hardening of the eyeball", caused by accumulation of aqueous fluid in the front portion.

Glioma: malignant tumor of the retina.

Gonioscope: a magnifying device used in combination with strong illumination and a contact glass for examining the angle of the anterior chamber.

Hemianopsia: blindness of one-half the field of vision of one or both eyes.

Heterophoria: a constant tendency of the eyes to deviate from the normal position for binocular fixation, counterbalanced by simultaneous fixation forced by muscular effort (prompted by the desire for single binocular vision). Deviation is not usually apparent, in which case it is said to be latent.

Heterotropia: an obvious or manifest deviation of the visual axis of an eye out of alignment with the other eye. Synonym for cross-eye, strabismus.

Hydrophthalmos: (congenital glaucoma) a rare congenital defect in which the eyeball is abnormally large.

Hyperopia, Hypermetropia: a refractive error in which, because the eyeball is short or the refractive power of the lens weak, the point of focus for rays of light from distant objects is behind the retina; thus accommodation to increase the refractive power of the lens is necessary for distant as well as near vision.

Hyperphoria: a tendency of one eye to deviate upwards.

Hypertropia: a deviation upwards of one of the visual axes.

Injection: a term sometimes used to mean congestion of ciliary or conjunctival blood vessels; redness of the eye.

Interstitial Keratitis: affection of the middle layer of the cornea; disease found chiefly in children and young adults, is usually caused by transmission of syphilis from mother to unborn child.

Iridocyclitis: inflammation of the iris and ciliary body.

Iris: colored, circular membrane, suspended behind the cornea and immediately in front of the lens. The iris regulates the amount of light entering the eye by changing the size of the pupil.

Iritis: inflammation of the iris; the condition is marked by pain, inflammation, discomfort from light, contraction of pupil, discoloration of iris. It may be caused by injury, syphilis, rheumatism, gonorrhea, tuberculosis, etc.

Ishihara Color Plates: a test for defects in recognizing colors, based on the ability to trace patterns in a series of multi-colored plates.

Jaeger Test: a test for near-vision; lines of reading matter printed in a series of various sizes of type.

Keratitis: inflammation of the cornea; frequently classified as to type of inflammation and layers of cornea affected as "interstitial" keratitis or "phlyctenular".

Keratoconus: cone-shaped deformity of the cornea.

Keratoplasty: see corneal graft.

Lacrimal Gland: a gland which secretes tears; it lies in the outer angle of the orbit.

Lacrimal sac: the dilated upper end of the lacrimal duct.

Lacrimation: production of tears.

Lagophthalmos: a condition in which the lids cannot be completely closed.

Lens: a refractive medium having one or both surfaces curved.

Light Adaptation: the power of the eye to adjust to variations in the amount of light.

Light Perception: (L. P.) ability to distinguish light from dark.

Limbus: boundary between cornea and sclera.

Low Vision Aids: optical devices of various types useful to persons with vision impairment.

Macrophthalmos: abnormally large eyeball, resulting chiefly from infantile glaucoma.

Macula Lutea: the small area of the retina that surrounds the fovea and with the fovea comprises the area of distinct vision.

Megalophthalmos: abnormally large eyeball present at birth (congenital).

Microphthalmos: an abnormally small eyeball present at birth (congenital).

Microscopic glasses: magnifying lenses arranged on a principle of a microscope, occasionally prescribed for persons with very poor vision.

Miotic: a drug that causes the pupil to contract.

Mydriatic: a drug that dilates the pupil.

Myopia: nearsightedness. A refractive error in which, because the eyeball is too long, the point of focus for rays of light from distant objects is in front of the retina. Thus, to obtain distinct vision, the object must be brought nearer to take advantage of divergent light rays (those from objects less than 20 feet away).

Near Point Accommodation: The nearest point at which the eye can perceive an object distinctly. It varies according to the power of accommodation.

Near Point of Convergence: the nearest single point at which the two eyes can direct their visual lines; normally about three inches from the eyes in young people.

Near Vision: the ability to perceive distinctly objects at normal reading distance, or about fourteen inches from the eyes.

Night blindness: a condition in which the vision is good by day, but deficient at night and in faint light.

Nystagmus: an involuntary rapid movement of the eyeball, it may be lateral, vertical, rotary, or mixed.

Oculist or Ophthalmologist: a physician, an M.D. who specializes in diagnosis and treatment of defects and diseases of the eye, performing surgery when necessary or prescribing other types of treatment, including glasses.

Oculus Dexter (O.D.): right eye.

Oculus Sinister (O.S.): left eye.

Oculus Uterque (O.U.): both eyes.

Ophthalmia Neonatorum: an acute purulent conjunctivitis in the newborn.

Ophthalmologist or Oculist: See Oculist.

Ophthalmoscope: an instrument used in examining the interior of the eye.

Optic Atrophy: degeneration of the nerve tissue which carries messages from the retina to the brain.

Optic chiasm: the crossing of the fibers of the optic nerves on the lower surface of the brain.

Optic Disk: head of the optic nerve in the eyeball.

Optician: one who grinds lenses, fits them into frames and adjusts the frames to the wearer.

Optic Nerve: the special nerve of the sense of sight which carries messages from the retina to the brain.

Optic Neuritis: inflammation of the optic nerve.

Optometrist: a licensed, nonmedical practitioner, measures refractive errors. In his treatment, the optometrist uses glasses, prisms and exercises only.

Orthoptic Training: series of scientifically planned exercises for developing or restoring the normal teamwork of the eyes.

Orthoptist: one who provides orthoptic training.

Palpebral: pertaining to the eyelid.

Pannus: invasion of the cornea by infiltration of lymph and formation of new blood vessels.

Partially seeing child: for educational purposes, a partially seeing child is one who has visual acuity of 20/70 or less in the better eye after correction and who can use his vision as his chief channel of learning.

Perimeter: an instrument for measuring the field of vision.

Peripheral vision: ability to perceive the presence, motion or color of objects outside the direct line of vision.

Phlyctenular Keratitis: a variety of keratitis characterized by the formation of papules on the cornea; usually occurs in young children and may be caused by poor nutrition. Many physicians believe it to be a tubercular condition.

Phoria: a root word denoting a latent deviation in which the eyes have a constant tendency to turn from the normal position for binocular vision; used with a prefix to indicate the direction of such deviation (hyperphoria, esophoria, exophoria).

Photophobia: abnormal sensitivity to and discomfort from light.

Pleoptics: a method of treating amblyopia through the use of instruments which restore fixation to the fovea by direction stimulation or by the production and correct localization of after images.

Posterior Chamber: space between the back of the iris and the front of the lens; filled with aqueous.

Presbyopia: a gradual lessening of the power of accommodation, due to a physiological change which becomes noticeable after the age of forty.

Prosthesis: an artificial substitute for a missing eye (or other missing part of the body).

Pseudoisochromatic Charts: charts with colored dots of various hues and shades indicating numbers, letters or patterns used for testing color discrimination.

Pterygium: a triangular fold of growing membrane which may extend toward the cornea on the white of the eye. It occurs most frequently in persons exposed to dust or wind.

Ptosis: a paralytic drooping of the upper lid.

Refraction: 1. deviation in the course of rays of light in passing from one transparent medium into another of different density. 2. determiantion of refractive errors of the eye and correction by glasses.

Refractive error: a defect in the eye that prevents light rays from being brought to a single focus exactly on the retina.

Refractive media: the transparent parts of the eye having refractive power; cornea, aqueous, lens, vitreous.

Retina: innermost coat of the eye, formed of sensitive nerve fibers and connected with the optic nerve.

Retinal Detachment: a separation of the retina from the choroid.

Retinitis: inflammation of the retina.

Retinitis pigmentosa: an hereditary degeneration and atrophy of the retina. There is usually misplaced pigment.

Retinoblastoma: the most common malignant intraocular tumor of childhood occurs usually under age five. It is probably always congenital.

Retinopathy: a disease of the retina due to various causes.

Retinoscope: an instrument for determining the refractive state of an eye by observing the movements of lights and shadows across the pupil by the light thrown into the retina by a moving mirror.

Retrolental Fibroplasia: a disease of the retina in which a mass of scar tissue forms on the back of the lens of the eye. Both eyes are affected in most cases and it occurs chiefly in infants born prematurely who receive excessive oxygen.

Rods and Cones: see Cones and Rods.

S.S. (Sine Correction): without correction, that is, not wearing glasses.

Safety glasses: impact resistant; available with or without visual correction.

Sclera: the white part of the eye—a tough covering, which with the cornea forms the external, protective coat of the eye.

Scleritis: inflammation of the sclera.

Scotoma: a blind, or partially blind area in the visual field.

Sensation: the reception of light or form by the retina and later the reception of the image by the brain.

Slit lamp: provides a narrow beam of strong light; often used with a corneal microscope for examinations of the front portions of the eye.

Snellen chart: used for testing central visual acuity. It consists of lines of letters, numbers or symbols in graded sizes drawn to Snellen measurements. Each size is labeled with the distance at which it can be read by the normal eye. Most often used for testing vision at 20 feet.

Spherical lens: segment of a sphere refracting rays of light equally in all meridians.

Stereoscopic Vision: ability to perceive relative position of objects in space without such cues as shadow, size and overlapping.

Strabismus: squint; failure of the two eyes simultaneously to direct their gaze at the same object because of muscle imbalance.

Strephosymbolia: a disorder of perception in which objects seem reversed as in a mirror; a reading difficulty inconsistent with the child's general intelligence beginning with confusion between similar, but oppositely oriented letters, (b-d-, q-p) and a tendency to reverse direction in reading.

Stye: acute inflammation of a sebaceous gland in the margin of the eyelid, due to infection and usually resulting in the formation of pus.

Sympathetic Ophthalmitis: inflammation of one eye due to an infection in the other eye.

Synechia: adhesion, usually of the iris to cornea or lens.

Tangent screen: a large black or gray curtain supported by a framework on which the normal central field and blind spot have been lightly outlined. This instrument is used for measuring the central field of vision.

Tarsus: the framework of connective tissue which gives shape to the eyelid.

Telescopic glasses: magnifying spectacles founded on the principles of a telescope; occasionally prescribed for improving very poor vision which cannot be helped by ordinary glasses.

Tension, Intraocular: the pressure or tension of the contents of the eyeball.

Tonometer: an instrument for measuring pressure inside the eye.

Trachoma: a form of infectious kerato-conjunctivitis caused by a specific virus which in the chronic form produces severe scarring of the eyelids and cornea.

Tropia: a root word denoting an obvious deviation from normal of the axis of the eyes (strabismus) used with a prefix to denote the type of strabismus as heterotropia, esotropia, exotropia.

Tunnel Vision: Contraction of the visual field to such an extent that only a small area of central visual acuity remains, thus giving the affected individual the impression of looking through a tunnel.

Uveal tract: entire vascular coat of the eyeball. It consists of the iris, ciliary body and choroid.

Uveitis: inflammation of the uveal tract of the eye.

Vision: the art or faculty of seeing; sight.

Visual acuity: see Central Visual Acuity.

Visual memory: refers to that skill in visual perception that deals with remembering a visual image that is no longer present.

Visual motor: the brains directing and focusing the eyes and the coordination of sight with other parts of the body.

Visual perception: the learned ability to construct a visual image, to be able to distinguish characteristics, and to give meaning to what one sees.

Visual purple: the pigment in the outer layers of the retina.

Visual sequencing: refers to that part of visual memory in which a sequence is involved.

Vitreous: transparent, colorless mass of soft, gelatinous material filling the eyeball behind the lens.

Vitreous Opacities: see Floaters.

Appendix C

Teacher's Guide for Evaluating Visual Functioning

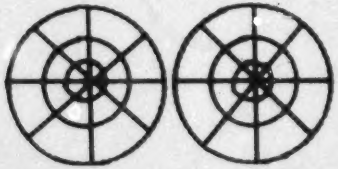
Teacher's Guide for Evaluating Visual Functioning

Student Name _____ Sex_____ Age_____ Grade Assignment _____

Part I
Sensation

	Findings	Date	Date
1. Is there a reaction to light by the child?	Yes		
	No		
	Comments:		
2. If there is a reaction, is it different to colored light?	Yes		
	No		
	Comments:		

Part I — Sensation (Continued)

	Findings	Date	Date
3. Are there blank spots in the vision field? If so, mark the blank areas of the visual field in the diagrams below. Left Eye Right Eye 	Yes		
	No		
	Comments:		
4. Are there any abnormal reactions to light evident (light gazing, object flicking, etc.)?	Yes		
	No		
	Comments:		
5. What is the child's visual acuity, both near and far?	Acuity—Near		
	Acuity—Far		
	Comments:		

Part II — Visual-Motor

1. Is the child able to track (visually follow) a light or object?	Findings	Date	Date
	Left — right		
	Yes		
	No		
	Comments:		
	Up — down		
	Yes		
	No		
	Comments:		
	Diagonal		
	Yes		
	No		
	Comments:		
	Circle		
	Yes		
	No		
	Comments:		

5-1

Part II — Visual-Motor (Continued)

2. Is the child able to follow a light or object moving toward him?	Findings	Date	Date
	Yes		
	No		
	Comments:		
3. If the child is able to follow a light or object moving toward him, how close is the object when he stops following it?	Inches		
	N/A		
	Comments:		
4. Can the child focus on an object near him?	Yes		
	No		
	Comments:		
5. How far away does the child hold an object when examining it? At what angle relative to his eyes. (Indicate under "comment").	Inches		
	N/A		
	Comments:		
6. Is the child able to change his focus from far to near objects?	Yes		
	No		
	Comments:		

Part II — Visual-Motor (Continued)

	Findings	Date	Date
7. Does the child have eye contact with you?	Yes		
	No		
8. Does the child have eye contact with objects?	Yes		
	No		
	Comments:		
9. Can the child follow objects across his midline?	Yes		
	No		
	Comments:		
10. Does the child reach quickly and accurately for objects?	Yes		
	No		
	Comments:		
11. Does the child require tactile clues in mobility and eating?	Yes		
	No		
	Comments:		
12. Can the child accurately put objects in a container?	Yes		
	No		
	Comments:		

556

Part II — Visual-Motor (Continued)

	Findings	Date	Date
13. Can the child climb up and down stairs accurately?	Yes		
	No		
	Comments:		
14. Can the child catch a ball?	Yes		
	No		
	Comments:		
15. Can the child kick a ball?	Yes		
	No		
	Comments:		
16. Can the child point to the parts of his body?	Yes		
	No		
	Comments:		
17. Can the child finger paint, scribble, draw recognizable pictures, and/or color within lines? (Indicate which.)	Yes		
	No		
	Comments:		
18. Can the child cut along a straight line with scissors, knife, etc.?	Yes		
	No		
	Comments:		

Part III
Visual Perception

	Findings	Date	Date
1. Does the child use common items such as cups, spoons, chairs, etc., purposefully?	Yes		
	No		
	Comments:		
2. Can the child perform with a form board accurately?	Yes		
	No		
	Comments:		
3. Can the child match colors?	Yes		
	No		
	Partial		
4. Does the child demonstrate visual memory?	Yes		
	No		
	Comments:		
5. Has the child overcome figure-ground confusion?	Yes		
	No		
	Comments:		

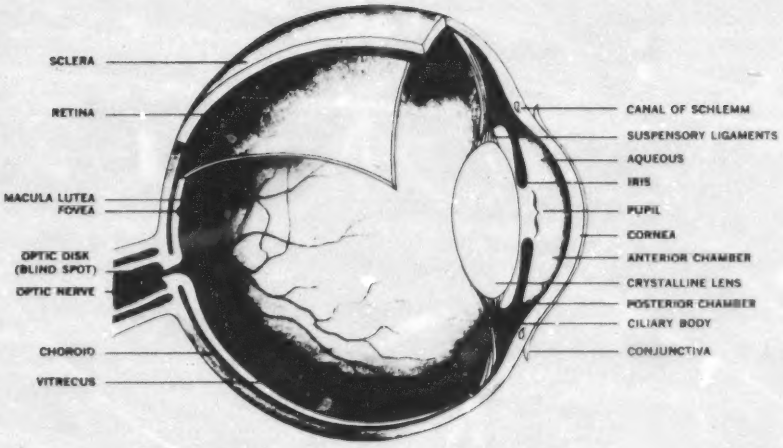
58

Part III — Visual Perception (Continued)

	Findings	Date	Date
6. Does the child demonstrate visual sequencing?	Yes		
	No		
	Partial		
7. Can the child follow "Simon Says" directions or imitate body movements?	Yes		
	No		
	Comments:		
8. Can the child duplicate geometric designs drawn by the teacher: straight lines, circles, squares, triangles, diamonds, etc? Indicate which, if any.	Comments:		
9. Can the child match letters?	Yes		
	No		
	Comments:		

Appendix D

Labeled Diagram of the Eye


SCLERA
RETINA
MACULA LUTEA
FOVEA
OPTIC DISK
(BLIND SPOT)
OPTIC NERVE
CHOROID
VITRECUS
CANAL OF SCHLEMM
SUSPENSORY LIGAMENTS
AQUEOUS
IRIS
PUPIL
CORNEA
ANTERIOR CHAMBER
CRYSTALLINE LENS
POSTERIOR CHAMBER
CILIARY BODY
CONJUNCTIVA

VOCABULARY OF TERMS RELATING TO THE EYE

ANTERIOR CHAMBER

Space in the front of the eye, bounded in front by the cornea and behind by the iris; filled with aqueous.

AQUEOUS

Clear, watery fluid which fills the anterior and posterior chambers within the front part of the eye.

CANAL OF SCHLEMM

A circular canal situated at the juncture of the sclera and cornea through which the aqueous is excreted after it has circulated between the lens and the iris and between the iris and the cornea.

CHOROID

The vascular, intermediate coat which furnishes nourishment to the other parts of the eyeball.

CILIARY BODY

Portion of the vascular coat between the iris and the choroid. It consists of ciliary processes and the ciliary muscle.

CONJUNCTIVA

Mucous membrane which lines the eyelids and covers the front part of the eyeball.

CORNEA

Clear, transparent portion of the outer coat of eyeball forming front of aqueous chamber.

CRYSTALLINE LENS

A transparent, colorless body suspended in the front of the eyeball, between the aqueous and the vitreous, the function of which is to bring the rays of light to a focus on the retina.

FOVEA

Small depression in the retina at the back of the eye; the part of the macula adapted for most acute vision.

IRIS

Colored, circular membrane, suspended behind the cornea and immediately in front of the lens. The iris regulates the amount of light entering the eye by changing the size of the pupil.

MACULA LUTEA

The small area of the retina that surrounds the fovea and with the fovea comprises the area of distinct vision. Syn. *yellow spot*.

OPTIC DISK

Head of the optic nerve in the eyeball.

OPTIC NERVE

The special nerve of the sense of sight which carries messages from the retina to the brain.

POSTERIOR CHAMBER

Space between the back of the iris and the front of the lens; filled with aqueous.

PUPIL

The contractile opening at the center of the iris for the transmission of light.

RETINA

Innermost coat of the eye, formed of sensitive nerve fibers and connected with the optic nerve.

SCLERA

The white part of the eye—a tough covering which, with the cornea, forms the external, protective coat of the eye.

SUSPENSORY LIGAMENTS

A complex structure of multiple bands of tissue which hold the crystalline lens in place.

VITREOUS

Transparent, colorless mass of soft, gelatinous material filling the eyeball behind the lens.

Bibliography

Barrage, Natalie. *Increased Visual Behavior in Low Vision Children.* New York: American Foundation for the Blind, 1967.

Board of Education of Montgomery County. *Vision Stimulation.* Rockville, Maryland: Board of Education of Montgomery County, 1969.

Braley, William T., M.Ed.; Konicki, Geraldine; Leedy, Catherine. *Daily Sensorimotor Training Activities, A Handbook for Teachers and Parents of Pre-School Children.* Deal, New Jersey: Kimbo Educational Records, 1968.

Calarusso, Ronald P., Ed.D. and Hammill, Donald D., Ed.D. *Motor-Free Visual Perception Test (MVPT).* San Rafael, California: Academic Therapy Publications, 1972.

Centers and Services for Deaf-Blind Children. Proposed Rules, Part 121 c.37. *Federal Register*, Volume 38, Number 196. October 11, 1973.

Curtis, Scott; Donlon, Edward T.; Wagner, Elizabeth, eds. *Deaf-Blind Children: A Program for Evaluation—Their Multiple Handicaps.* New York: American Foundation for the Blind, 1970.

Dorward, Barbara. *Teaching Aids and Toys for Handicapped Children. Arlington, Virginia:* The Council for Exceptional Children, 1960.

Ficociello, Carmella, M.Ed. *Vision Stimuli for Low-Functioning Deaf-Blind Rubella Children.* 1974.

Frostig, Marianne and Horne, David. *The Frostig Program for the Development of Visual Perception, Teacher's Guide.* Chicago, Illinois: Follett Publishing Co., 1964.

Geake, Robert, Ph.D. and Smith, Donald, Ph.D. *Michigan Tracking Program.* Ann Arbor, Michigan: Ann Arbor Publishers, 1962.

Guldagen, Virginia. *Body Image and the Severely Handicapped Rubella Child.* Watertown, Mass.: Perkins School for the Blind, 1970.

Kirk, Samuel A. *Educating Exceptional Children.* 2nd ed. Boston, Massachusetts: Houghton Mifflin Co., 1972.

Kirshnen, A. J. *Training that Makes Sense.* San Rafael, California: Academic Therapy Publications, 1972.

Leach, Fay. *Commercially Available Instructional Materials for use in the Development of Elementary Readiness Skills in Young Visually Handicapped Students.* Louisville, Kentucky: American Printing House for the Blind, 1972.

Liebman, Sumner D., M.D.; Gellis, Sydney S., M.D., eds. The *Pediatrician's Ophthalmology*. Saint Louis, Missouri: The C. V. Mosby Co., 1966.

Lin-Fu, Jane S., M.D., F.A.A.P. *Vision Screening of Children*. Washington, D. C.: Superintendent of Documents, U. S. Government Printing Office, 1971.

Meyers, Elizabeth S.; Ball, Helen, H.; Crutchfield, Marjorie. *The Kindergarten Teacher's Handbook*. Los Angeles, California: Grammerey Press, 1973.

Moriarty, Donald F.; Smith, William J.; Horsley, June L., eds. *Diagnosis and Evaluation of Deaf-Blind Children*. Denver, Colorado: Mountain Plains Regional Center for Services to Deaf-Blind Children Colorado Department of Education, 1973.

Mountain Plains Regional Center for Services to Deaf-Blind Children. *Developmental Scales to be used in Assessing Development of Deaf-Blind Children*. Denver, Colorado: Mountain Plains Regional Center for Services to Deaf-Blind Children.

Mountain Plains Regional Center for Services to Deaf-Blind Children. *Instructional Materials and Equipment*. Denver, Colorado. Mountain Plains Regional Center for Services to Deaf-Blind Children.

Mueller, Conrad G. and Rudolph, Mae, The Editor's of Life. *Light and Vision*. New York: Time Incorporated, 1966.

Napier, Grace D. and Weishahn, M l W. *Handbook for Teachers of the Visually Handicapped*. Louisville, Kentucky: American Printing House for the Blind, 1970.

Office of the Superintendent of Public Instruction of Illinois, Kay Page, Supt. *Vision Screening Guide*. Chicago, Illinois: Illinois Society for the Prevention of Blindness, 1969.

Reilly, Mary Ann, ed. *New Staff Orientation Workshop Proceedings*. Dallas, Texas: Callier Center for Communication Disorders, 1973.

Rex, Evelyn J., ed. *Proceedings of a Special Study Institute: Methods and Procedures for Training Low Vision Skills*. Norman, Illinois: Department of Special Education, College of Education, Illinois State University, 1971.

Richmond, P. G. *An Introduction to Piaget*. New York: Basic Books, Inc., Publishers, 1971.

Roach, Eugene G., Dr. and Kephart, Newell C., Dr. *The Purdue Perceptual-Motor Survey*. Columbus, Ohio: Charles E. Merrill Books, Inc., 1966.

Sheridan, Mary, M.D. *Stycar Vision Tests (6 months to 7 years)*. Berks, England: N.F.E.R. Publishing Co. Ltd., 1969.

Slosson, Richard L. *Slosson Drawing Coordination Test (SDCT) for Children and Adults*. East Aurora, New York: Slosson Educational Publications Inc., 1973.

Smith, Donald E. P. and Smith, Judith M. *Michigan Language Program*. Ann Arbor, Michigan: Ann Arbor Publishers, 1970.

The New York Association for the Blind. "A Flash-Card Vision Test for Children." *Catalog of Optical Aids*, 1974, catalog no. LHDV-1.

The Project Staff, East San Gabriel School. *An Educational Program for Multi-Handicapped Children*. Los Angeles, California: Office of the Los Angeles Superintendent of Schools, Communications Center, Duplicating Unit, 1972.

Try Problem. New York: Noble and Noble Publishers, Inc.

PRINTED BY:

Special Education
Instructional Materials Development Center

Winston-Salem, N. C.

STAFF:

Coordinator ..... Clarence McKee
Assistant Coordinator, Planner ..... Karen Haywood
Secretary ..... Adelene Whitman
Production Aide ..... Shirley Jordan
Graphic Artist ..... Brenda Wagner
Printer Apprentice ..... Robert Bullard
Materials Agent ..... Frances Hoover

Winston-Salem/Forsyth County Schools
Board of Education

Mrs. Omeda Brewer, Chairman
Thomas C. Voss, Vice-Chairman
Beaufort Bailey
Henry C. Laureman
Alan R. Perry
John A. Redding
Mrs. Betsy Sawyer
Ms. Nancy Wooten

Winston-Salem/Forsyth County Schools
Administrative Staff

Marvin Ward, Superintendent
Raymond Sarbaugh, Associate Superintendent
C. Douglas Carter, Special Assistant for
Instructional Services

The SPECIAL EDUCATION INSTRUCTIONAL MATERIALS DEVELOPMENT CENTER is a cooperative project, funded by the Division for Exceptional Children of the Department of Public Instruction, Raleigh, North Carolina under a federal grant, Title VI-B.

First Edition 1975